In the Claims:

1. (Currently Amended) A method for determining component flow rates of a multiphase fluid in a conduit, the fluid consisting of at least three known components, the fluid having a pressure and temperature at each location of the fluid, the method comprising the steps of:

a) measuring at each of two different positions along the conduit at least four mixture quantities;

b) providing speed of sound values for each of the components at the pressures and temperatures at which the four different mixture quantities are measured;

c) providing a trial value for each of either the component flow rates or phase fractions of the fluid;

d) using a predetermined model to calculate values for the measured mixture quantities based on the speed of sound values and the trial values for each of either the component flow rates or the phase fractions;

e) using a predetermined error function to determine an error value based on differences between the measured mixture quantities and the calculated values for the measured mixture quantities;

f) determining whether the calculated values are acceptable based on the error value; and

g) if ~~they~~ the calculated values are not acceptable, using a predetermined optimizing algorithm to provide a new trial value for each of either the component flow rates or the phase fractions and repeating steps d through f.

2. (Original) A method as in claim 1, wherein the error function is the sum of the squares of the difference between the measured and calculated values at each point.

3. (Original) A method as in claim 1, wherein the four mixture quantities are the sound speed, the flow velocity of the multiphase fluid, the pressure and the temperature.

4. (Currently Amended) An apparatus for determining component flow rates of a multiphase fluid in a conduit, the fluid consisting of at least three known components, the fluid having a pressure and temperature at each location of the fluid, the apparatus comprising:

sensors for measuring at each of two different positions along the conduit at least four mixture quantities;

a modeler for using a predetermined model to calculate values for the measured mixture quantities based on speed of sound values for each of the components at the pressures and temperatures at which the four different mixture quantities are measured and trial values for each of either the component flow rates or the phase fractions, the trial values and speed of sound values provided to the modeler;

an error function evaluator for using a predetermined error function to determine an error value value based on differences between the measured mixture quantities and the calculated values for the measured mixture quantities; and

an optimizer for using a predetermined optimizing algorithm to determine whether the calculated values are acceptable based on the error value and, if ~~they~~ the calculated values are not acceptable, provide a new trial value to the modeler for each of either the component flow rates or the phase fractions.

5. (Previously Presented) An apparatus as in claim 4, wherein the error function is the sum of the squares of the difference between the measured and calculated values at each point.

6. (Previously Presented) An apparatus as in claim 4, wherein the four mixture quantities are the sound speed, the flow velocity of the multiphase fluid, the pressure and the temperature.